PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-367576

(43)Date of publication of application : 20.12.2002

---

(51)Int.Cl. H01M 2/06
H01M 2/02
H01M 2/30
H01M 10/40

---

(21)Application number : 2001-173697 (71)Applicant : YUASA CORP

(22)Date of filing : 08.06.2001 (72)Inventor : NOSAKA TAKEYOSHI
YONEDA TATSUNOBU
ONDA TOSHIYUKI

---

(54) LITHIUM ION BATTERY

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a lithium ion battery capable of surely bonding a negative terminal, a positive terminal, and a metal resin film.
SOLUTION: This lithium ion battery 10 is equipped with fusion bonding margins 24, 25, 26 having the specified width dimension installed in a package 20 so as to envelope a power generating element 14, and insulating films 27, 28 covering the specified positions 15B, 16B of the negative terminal 15, the positive terminal 16 interposed with the fusion bonding margin 26. The fusion boding margin 26 has a fusion bonding part 26A in which the metal resin composite film 21 of a package 20 is fusion bonded to the insulating films 27, 28, and a non-fusion bonding part 26B in which the metal resin composite film 21 is not fusion bonded to the insulating films 27, 28. The fusion bonding part 26A is installed on the outer side in the insulating films 27, 28.

LEGAL STATUS [Date of request for examination] 30.03.2006
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The generation-of-electrical-energy element possessing a separator, a negative electrode, and a positive electrode, and the terminal of a pair joined to said negative electrode and said positive electrode, respectively, The package which carries out hold closure of said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure, It is the lithium ion battery equipped with the welding cost which has the predetermined width method formed in said package, and the insulating coat pinched by said welding cost while covering the predetermined location of each of said terminal. The lithium ion battery characterized by equipping said welding cost with the welding section which the metal resin complex film of said package welds to said insulating coat, and the non-welding

section which said metal resin complex film does not weld to said insulating coat.
[Claim 2] The lithium ion battery indicated to claim 1 characterized by the method side edge section of inside in said insulating coat being separated from said welding section 2mm or more while the width method of said welding section is 1mm or more.
[Claim 3] The generation-of-electrical-energy element possessing a separator, a negative electrode, and a positive electrode, and the terminal of a pair joined to said negative electrode and said positive electrode, respectively, The package which carries out hold closure of said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure, It is the lithium ion battery equipped with the welding cost which has the predetermined width method formed in said package, and the insulating coat pinched by said welding cost while covering the predetermined location of each of said terminal. The lithium ion battery with which at least the part of the thickness direction front faces of said insulating coat is characterized by not carrying out welding to either [at least] said each terminal or said metal resin complex films.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the lithium ion battery with which the lithium ion battery was started especially by which each predetermined location of a negative-electrode terminal and a positive-electrode terminal was covered with the insulating coat.
[0002]
[Description of the Prior Art] In recent years, small lightweight-ization of the portable electronic device for general users is progressing, and the lithium ion battery of the formation of small lightweight is used abundantly by the big advance of an electronic technique as an energy source of this electronic equipment. Especially, a metal resin complex film is used for a package, and a part of lithium ion battery which attained small lightweight-ization further is put in practical use.
[0003] That to which the laminating of the welding nature resin layer in which the package made from a metal resin complex film has a metal adhesive property made of polyolefine system resin, such as polypropylene (PP) along the protective layer of

polyamide resin, such as polyester resin, such as polyethylene terephthalate (PET) along the front face of the metallic foil core material made from aluminium foil and a metallic foil core material, and nylon, or the product made of polyimide resin and the rear face of a metallic foil core material or polyethylene (PE), was carried out is used.

[0004] In case the lithium ion battery which used the metal resin complex film for the package is manufactured, the generation-of-electrical-energy element 65 is formed by winding, as the negative-electrode terminal 62 and the positive-electrode terminal 63 are joined to a negative electrode 60 and a positive electrode 61, respectively as shown in drawing 3 , the laminating of the separator 64 is carried out to these negative electrodes 60 and positive electrodes 61, for example, it is shown in the arrow head of drawing 4 (refer to drawing 5). The lithium ion battery 70 which shows this generation-of-electrical-energy element 65 to drawing 6 by bending a package 66 (referring to drawing 6) in the center, and carrying out hold closure is formed.

[0005] The hollow (namely, hold section 68) corresponding to the configuration of the generation-of-electrical-energy element 65 is beforehand formed above central bending section 67A in the metal resin complex film 67 with which the package 66 was formed in the shape of a rectangle.

[0006] After arranging the generation-of-electrical-energy element 65 in this hold section 68, the metal resin complex film 67 is bent by central bending section 67A. Pile up the metal resin complex film of the upper part [A / bending section 67], and the metal resin complex film of a center to a lower part, and the generation-of-electrical-energy element 65 is put. Hold closure of the generation-of-electrical-energy element 65 is carried out with a package 66 by heating three sides of the metal resin film 67 made to pile up mutually, and forming the welding cost 67B, 67C, and 67D. In this case, while pinching the metal negative-electrode terminal 62 and the metal positive-electrode terminal 63 by welding cost 67D, welding cost 67D is melted and it is made to join to the negative-electrode terminal 62 and the positive-electrode terminal 63.

[0007]

[Problem(s) to be Solved by the Invention] However, since the negative-electrode terminal 62 and the positive-electrode terminal 63 are metal terminals, a limitation is to stick certainly welding cost 67D of the metal resin film 67 for the negative-electrode terminal 62 and the positive-electrode terminal 63. For this reason, it is possible that the electrolytic solution held in the hold section 68 leaks from the clearance between welding cost 67D, and the negative-electrode terminal 62 and the positive-electrode terminal 63.

[0008] The technique of sticking the resin sheet 80 and welding cost 67D is indicated by carrying out thermal melting arrival of the resin sheet 80 comrades beforehand in JP,2000-138057,A, where the resin sheet 80 is put on the negative-electrode terminal 62 and the positive-electrode terminal 63 as shown in drawing 7 in order to cancel this fault,

and putting and carrying out thermal melting arrival of the resin sheet 80 with the metal resin film 67, as shown in drawing 8 below.

[0009] However, the contact surface 81 of the resin sheet 80 in contact with the negative-electrode terminal 62 and the positive-electrode terminal 63 can consider that heating of an eye is once performed in case thermal melting arrival of the resin sheet 80 comrades is carried out, the second heating is performed in case thermal melting arrival of the resin sheet 80 and the metal resin film 67 is carried out, it is ruined in case it is the second heating, and adhesion falls. For this reason, utilization of the lithium ion battery to which the negative-electrode terminal 62, the positive-electrode terminal 63, and the metal resin film 67 can be stuck certainly was desired.

[0010] This invention is made in view of the trouble mentioned above, and the purpose is in offering the lithium ion battery to which a negative-electrode terminal and a positive-electrode terminal, and a metal resin film can be stuck certainly.

[0011]

[Means for Solving the Problem] In order to attain the purpose mentioned above, as indicated to claim 1, this invention The generation-of-electrical-energy element possessing a separator, a negative electrode, and a positive electrode, and the terminal of a pair joined to said negative electrode and said positive electrode, respectively, The package which carries out hold closure of said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure, It is the lithium ion battery equipped with the welding cost which has the predetermined width method formed in said package, and the insulating coat pinched by said welding cost while covering the predetermined location of each of said terminal. It is characterized by equipping said welding cost with the welding section which the metal resin complex film of said package welds to said insulating coat, and the non-welding section which said metal resin complex film does not weld to said insulating coat.

[0012] Thus, in the constituted lithium ion battery, it is equipping welding cost with the non-welding section, and can prevent that it is ruined. For this reason, a negative-electrode terminal and a positive-electrode terminal, and each insulating coat can be stuck certainly. Furthermore, welding cost can be certainly stuck on an insulating coat by equipping welding cost with the welding section.

[0013] By the way, if a way side is not stuck on an insulating coat outside welding cost, there is a possibility that welding cost may exfoliate from an outside, for example during conveyance of an ion cell. Then, in order to prevent that welding cost exfoliates from an outside, it is desirable to arrange the welding section to the method side of outside, and to stick a way side on an insulating coat outside welding cost.

[0014] For this reason, in this invention, as indicated to claim 2, while the width method of said welding section is 1mm or more, it is characterized by the method side edge section of inside in said insulating coat being separated from said welding section 2mm or more.

[0015] When the width method of the welding section is too small in the width method of the welding section being less than 1mm and the electrolytic solution carries out diffuse transmission through the welding section, there is a possibility of leaking outside. Then, the width method of the welding section is set as 1mm or more, and the diffuse transmission of the electrolytic solution was prevented. Moreover, in order to acquire airtightness practically sufficient between a terminal and an insulating coat, the faying surface product of an insulating coat to a terminal is required more than fixed, but since the method side edge section of inside in an insulating coat becomes [the total width method of an insulating coat] it small that it is less than 2mm from the welding section, it is hard to secure request area. For this reason, this fault was avoided when the method side edge section of inside in an insulating coat set it as 2mm or more from the welding section.

[0016] Moreover, the generation-of-electrical-energy element which possesses a separator, a negative electrode, and a positive electrode as this invention was indicated to claim 3, The terminal of a pair joined to said negative electrode and said positive electrode, respectively, and the package which carries out hold closure of said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure, It is the lithium ion battery equipped with the welding cost which has the predetermined width method formed in said package, and the insulating coat pinched by said welding cost while covering the predetermined location of each of said terminal. At least the part of the thickness direction front faces of said insulating coat is characterized by not carrying out welding to either [at least] said each terminal or said metal resin complex films.

[0017] the structure of setting as an insulating coat here without carrying out welding of some of insulating coats concerned to a terminal beforehand when the width method of the insulating coat concerned is carrying out abbreviation coincidence with the width method of welding cost -- or in forming welding cost, the structure of setting without carrying out welding of some of insulating coats concerned to a metal resin complex film etc. can be illustrated. Moreover, the structure made to project in a package may be adopted by setting up the width method of the insulating coat concerned beforehand more greatly than the width method of welding cost, and forming the welding cost which has a fixed width method as an insulating coat.

[0018]

[Embodiment of the Invention] Hereafter, the operation gestalt concerning this invention is explained to a detail based on a drawing. In addition, in each operation gestalt explained below, explanation is simplified or omitted by attaching the same sign or a considerable sign all over drawing about the member explained in drawing 1 .

[0019] As shown in drawing 1 , the lithium ion battery 10 which is the 1st operation gestalt concerning this invention The generation-of-electrical-energy element 14 possessing a negative electrode 11 and a positive electrode 12, and the

negative-electrode terminal 15 and the positive-electrode terminal 16 joined to the negative electrode 11 and the positive electrode 12, respectively, The package 20 which carries out hold closure of the generation-of-electrical-energy element 14 so that open end section 15A of the negative-electrode terminal 15 and open end section 16A of the positive-electrode terminal 16 may carry out external exposure, The welding cost 24, 25, and 26 which has the predetermined width method formed in the periphery of a package 20 so that the generation-of-electrical-energy element 14 might be surrounded, While covering the predetermined locations 15B and 16B of the negative-electrode terminal 15 and the positive-electrode terminal 16, it has the insulating coat 27 for negative-electrode terminals and the insulating coat 28 for positive-electrode terminals which are pinched by the welding cost 26.

[0020] The generation-of-electrical-energy element 14 is wound in the shape of an abbreviation ellipse while it has the separator 13 interposed between the negative electrode 11 and the positive electrode 12, and the separator 13 protrudes rather than the negative electrode 11 and the positive electrode 12 in shaft-orientations both-ends 14A of the generation-of-electrical-energy element 14.

[0021] The hollow (namely, hold section 23) corresponding to the configuration of the generation-of-electrical-energy element 14 is beforehand formed above the central bending section 22 in the metal resin complex film 21 with which the package 20 was formed in the shape of a rectangle.

[0022] the metal resin complex film 21 is shown in drawing 2 -- as -- the metallic foil of the product made from aluminium foil as an example -- a core -- 21A and a metallic foil -- a core -- protective layer 21B which has a metal adhesive property made of the resin along the front face of 21A, and a metallic foil -- a core -- that to which the laminating of welding nature resin layer 21C which has a metal adhesive property made of the resin along the rear face of 21A was carried out is used abundantly.

[0023] The insulating coat 27 is the sheet of the pair which pinches the vertical side of the negative-electrode terminal 15, and the coat which has a metal adhesive property made of resin is used abundantly. The insulating coat 28 is the sheet of the pair which pinches the vertical side of the negative-electrode terminal 16, and the coat which has a metal adhesive property made of resin is used abundantly. After these insulating coats 27 and 28 have put the negative-electrode terminal 15 and the positive-electrode terminal 16 on each, thermal melting arrival of insulating coat 27 comrade of a pair and the insulating coat comrade 28 of a pair is carried out beforehand.

[0024] After arranging the generation-of-electrical-energy element 14 in the hold section 23, the welding cost 24, 25, and 26 shown in drawing 1 heats three sides of a metal resin film which bent the metal resin complex film 21 in the bending section 22, piled up the metal resin complex film of the upper part [section / 22 / bending], and the metal resin complex film of the bending section 22 to a lower part, and put and piled up the generation-of-electrical-energy element 14, and is formed.

[0025] As shown in drawing 2 , the welding cost 26 is equipped with welding section 26A which the metal resin complex film 21 of a package 20 welds to the insulating coats 27 and 28, and non-welding section 26B which the metal resin complex film 21 does not weld to the insulating coats 27 and 28, and welding section 26A is prepared in the method side of outside in the insulating coats 27 and 28. That is, when carrying out thermal melting arrival of the welding cost 26, thermal melting arrival is carried out and it was made not to carry out heating pressurization by carrying out heating pressurization only of the welding section 26A like an arrow head at non-welding section 26B.

[0026] Thus, by equipping the welding cost 26 with non-welding section 26B, it can prevent that it is ruined. For this reason, the negative-electrode terminal 15 and the positive-electrode terminal 16, and each insulating coat 27 and 28 can be stuck certainly. Furthermore, the welding cost 26 can be certainly stuck on the insulating coats 27 and 28 in the field of welding section 26A by equipping the welding cost 26 with welding section 26A. Therefore, it can prevent that the electrolytic solution in a package 20 leaks outside.

[0027] By the way, if a way side is not stuck on the insulating coats 27 and 28 outside the welding cost 26, there is a possibility that the welding cost 26 may exfoliate from an outside, for example during conveyance of a lithium ion battery 10. Then, it prevented that the welding cost 26 exfoliated from an outside by arranging the welding section 26 to the method side of outside, and sticking a way side on the insulating coats 27 and 28 outside the welding cost 26.

[0028] As for the welding cost 26, a width method is L and the width method L1 of welding section 26A is 1mm or more. In addition, it is set up so that method side edge section of inside 26C in the insulating coats 27 and 28 may separate from welding section 26A L2= 2mm or more.

[0029] When the width of face of welding section 26A is too small in the width method L1 of welding section 26A being less than 1mm and the electrolytic solution carries out diffuse transmission through welding section 26A, there is a possibility of leaking outside. Then, the width method L1 of welding section 26A is set as 1mm or more, and the diffuse transmission of the electrolytic solution was prevented.

[0030] Moreover, although the faying surface product of the insulating coats 27 and 28 to the negative-electrode terminal 15 and the positive-electrode terminal 16 is required more than fixed in order to acquire airtightness practically sufficient between the negative-electrode terminal 15 and the positive-electrode terminal 16, and the insulating coats 27 and 28 Since the method side edge section of inside in the insulating coats 27 and 28 becomes [the total width method of the insulating coats 27 and 28] it small that it is less than 2mm from welding section 26A, it is hard to secure request area. For this reason, this fault was avoided when the method side edge section of inside in the insulating coats 27 and 28 set it as 2mm or more from welding section 26A.

[0031] By the way, if a fixed period passes, corrosion will generate the conventional lithium ion battery on the front face of the negative-electrode terminal exposed in a package, and the front face of a positive-electrode terminal. When these corrosion grew toward the open end section of a negative-electrode terminal, and the open end section of a positive-electrode terminal, there was a problem that the adhesion between a negative-electrode terminal and a positive-electrode terminal, and an insulating coat falls, the electrolytic solution carried out external leakage by this, and the initial engine performance fell. The moisture which carried out diffuse transmission of the insulating coat, and infiltrated into the interior of a package contacts the electrolytic solution, and this problem generates the acid of the concentration more than fixed, and is considering as the cause that this acid makes the front face of a negative-electrode terminal, and the front face of a positive-electrode terminal corrode.

[0032] That is, since the width method of an insulating coat carries out abbreviation coincidence of the conventional lithium ion battery with the width method of welding cost and welding of the abbreviation whole region of an insulating coat is carried out to the metal resin complex film, the moisture which carried out diffuse transmission of the insulating coat will be emitted to the interior of a package by making the end face of an insulating coat into a transparency outlet. Under the present circumstances, since the very narrow end face in an insulating coat serves as a transparency outlet of moisture, the conventional lithium ion battery is in the inclination for the concentration per unit area of the moisture emitted from a transparency outlet to become comparatively high. If such high-concentration moisture contacts the electrolytic solution, it will generate a high-concentration acid.

[0033] And since the transparency outlet where high-concentration moisture is emitted is extremely arranged in near to the front face of a negative-electrode terminal, and the front face of a positive-electrode terminal, the high-concentration acid generated [near the transparency outlet] reaches easily to the front face of a terminal, and the conventional lithium ion battery makes corrosion start.

[0034] Since non-welding section 26B to which welding of the insulating coats 27 and 28 and the metal resin complex film 21 is not carried out in the welding cost 26 is prepared in the interior side of a package 20, if the lithium ion battery 10 of this invention mentioned above to such a conventional lithium ion battery is put in another way, the front face of the insulating coats 27 and 28 corresponding to non-welding section 26B will be wide opened toward the interior of a package 20. That is, the front face of the insulating coats 27 and 28 with which the lithium ion battery 10 of this invention was wide opened toward the end face of the insulating coats 27 and 28 and the interior of a package 20 serves as a transparency outlet of moisture, and the area of a transparency outlet is expanded as compared with the conventional lithium ion battery.

[0035] For this reason, in the lithium ion battery 10 of this invention, since the moisture emitted to the interior of a package 20 distributes broadly and is emitted as compared

with the conventional lithium ion battery, the concentration per unit area of a transparency outlet becomes low. When such low-concentration moisture contacts the electrolytic solution, the concentration of the generated acid is low as compared with the former, and does not reach to the concentration which specifically starts corrosion to the front face of the negative-electrode terminal 15, and the front face of the positive-electrode terminal 16.

[0036] Therefore, according to the lithium ion battery 10 of this invention, after a fixed period's passing, even if moisture carries out diffuse transmission of the insulating coats 27 and 28 and infiltrates into the interior of a package 20, unlike the conventional lithium ion battery, since the airtightness of a package 20 is maintainable for a long period of time, the electrolytic solution does not carry out external leakage, but the extremely excellent effectiveness that the initial engine performance is maintainable by this for a long period of time is acquired.

[0037] Moreover, the lithium ion battery shown in drawing 9 and drawing 10 is also contained in this invention. Namely, lithium ion battery 10A of the 2nd operation gestalt shown in drawing 9 It sets without the width method of the insulating coats 27 and 28 carrying out abbreviation coincidence with the width method L of the welding cost 26 and carrying out welding of some insulating coats 27 and 28 to the negative-electrode terminal 15 and the positive-electrode terminal 16 beforehand. And in forming the welding cost 26, non-welding section 26B to which welding of some insulating coats 27 and 28 is not carried out to the metal resin complex film 21 is formed.

[0038] Therefore, the part corresponding to non-welding section 26B [in / in this lithium ion battery 10A / thickness direction both sides of the insulating coats 27 and 28] is wide opened toward the interior of a package 20. For this reason, according to such lithium ion battery 10A, after a fixed period's passing, even if moisture carries out diffuse transmission of the insulating coats 27 and 28 and infiltrates into the interior of a package 20, the same effectiveness as the 1st operation gestalt mentioned above that the initial engine performance is maintainable for a long period of time is acquired.

[0039] On the other hand, since the transparency outlet of the insulating coats 27 and 28 is a large area as compared with the 1st operation gestalt mentioned above according to this lithium ion battery 10A, if concentration of the moisture per unit area of a transparency outlet can be made low and put in another way, concentration of the acid generated in the interior of a package 20 can be made low. Therefore, according to this lithium ion battery 10A, as compared with the 1st operation gestalt mentioned above, the effectiveness that the initial engine performance is maintainable for a long period of time is acquired notably.

[0040] Next, the welding section is formed so that lithium ion battery 10B of the 3rd operation gestalt shown in drawing 10 may correspond to the width method of the welding cost 26 while the width method of the insulating coats 27 and 28 is set up beforehand more greatly than the width method L of the welding cost 26, and the

non-welding section is not formed. The edges 27B and 28B of the insulating coats 27 and 28 have projected this lithium ion battery 10B inside the package 20.

[0041] Since the transparency outlet is large-area-ized by the edges 27B and 28B of the insulating coats 27 and 28 which project inside a package 20 as compared with the former according to such lithium ion battery 10B, After a fixed period's passing, even if moisture carries out diffuse transmission of the insulating coats 27 and 28 and infiltrates into the interior of a package 20, the same effectiveness as the 1st operation gestalt and the 2nd operation gestalt which were mentioned above that the initial engine performance is maintainable for a long period of time is acquired.

[0042] Since the edges 27B and 28B of the insulating coats 27 and 28 have projected inside the package 20 on the other hand according to this lithium ion battery 10B, The part which an acid generates from the negative-electrode terminal 15 and the positive-electrode terminal 16 in the interior of a package 20 can be kept away by arranging the edges 27B and 28B of the insulating coats 27 and 28 in the part distant from the negative-electrode terminal 15 and the positive-electrode terminal 16 in the interior of a package 20. Therefore, according to this lithium ion battery 10B, as compared with the 1st operation gestalt and the 2nd operation gestalt which were mentioned above, the effectiveness that the initial engine performance is maintainable for a long period of time is acquired notably.

[0043] In addition, although each operation gestalt mentioned above explained the example which joined the negative-electrode terminal and the positive-electrode terminal for the generation-of-electrical-energy element to the negative electrode and the positive electrode, respectively, and the separator was made to intervene between these negative electrodes and a positive electrode, and was wound For example, since the solid electrolyte layer is formed between the negative electrode and the positive electrode in the solid electrolyte rechargeable lithium-ion battery, there is little possibility of the short circuit between these, and it is good also as a configuration which does not form a separator between a negative electrode and a positive electrode.

[0044] Furthermore, this invention will not be limited to the operation gestalt mentioned above, proper deformation, amelioration, etc. are possible, and if this invention can be attained, the quality of the material of the generation-of-electrical-energy element illustrated in the operation gestalt mentioned above, a positive-electrode terminal, a negative-electrode terminal, an insulating coat, a package, etc., a configuration, a dimension, the gestalt, the number, the arrangement part, the thickness dimension, etc. will be arbitrary, and will not be limited.

[0045]

[Effect of the Invention] As mentioned above, according to this invention, as explained, as indicated to claim 1, the predetermined location of a negative-electrode terminal and a positive-electrode terminal is covered with an insulating coat, respectively, and the welding cost which pinches an insulating coat is divided into the welding section and

the non-welding section.

[0046] By equipping welding cost with the non-welding section, it can prevent that it is ruined. For this reason, a negative-electrode terminal and a positive-electrode terminal, and each insulating coat can be stuck certainly. Furthermore, welding cost can be certainly stuck on an insulating coat by equipping welding cost with the welding section. Therefore, it can prevent that the electrolytic solution in a package leaks outside.

[0047] By the way, if a way side is not stuck on an insulating coat outside welding cost, there is a possibility that welding cost may exfoliate from an outside, for example during conveyance of a lithium ion battery. Then, it prevented that welding cost exfoliated from an outside by arranging the welding section to the method side of outside, and sticking a way side on an insulating coat outside welding cost.

[0048] Moreover, according to this invention, as indicated to claim 2, when the width method of the welding section is too small in the width method of the welding section being less than 1mm and the electrolytic solution carries out diffuse transmission through the welding section, there is a possibility of leaking outside. Then, the width method of the welding section is set as 1mm or more, and the diffuse transmission of the electrolytic solution was prevented.

[0049] Moreover, since the method side edge section of inside in an insulating coat was not able to acquire airtightness practically sufficient between a terminal and an insulating coat from the welding section as it is less than 2mm, this fault was avoided when the method side edge section of inside in an insulating coat set it as 2mm or more from the welding section.

[0050] furthermore , since the welding at least of the part of the thickness direction front faces of an insulating coat be carry out to either [at least] each terminal or metal resin complex films according to this invention as indicate to a claim 3 , the concentration of the acid generate inside a package by the transparency outlet of the insulating coat a coat be expanded as compared with the former can be make low , and , thereby , an initial engine performance can be maintain for a long period of time .

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the lithium ion battery of the 1st operation gestalt concerning this invention.

[Drawing 2] It is the important section sectional view showing the lithium ion battery of the 1st operation gestalt concerning this invention.

[Drawing 3] It is the 1st explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 4] It is the 2nd explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 5] It is the 3rd explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 6] It is the 4th explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 7] It is the 5th explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 8] It is the 6th explanatory view showing how to manufacture the conventional lithium ion battery.

[Drawing 9] It is the important section sectional view showing the lithium ion battery of the 2nd operation gestalt concerning this invention.

[Drawing 10] It is the important section sectional view showing the lithium ion battery of the 3rd operation gestalt concerning this invention.

[Description of Notations]

10, 10A, 10B Lithium ion battery

11 Negative Electrode

12 Positive Electrode

13 Separator

14 Generation-of-Electrical-Energy Element

14A The shaft-orientations both ends of a generation-of-electrical-energy element

15 Negative-Electrode Terminal

15A The open end section of a negative-electrode terminal

15B The predetermined location of a negative-electrode terminal

16 Positive-Electrode Terminal

16A The open end section of a positive-electrode terminal

16B The predetermined location of a positive-electrode terminal

20 Package

21 Metal Resin Complex Film

24, 25, 26 Welding cost

25A, 26A Edge of an insulating coat

26A Welding section

26B Non-welding section

26C Inner direction side edge section

27 28 Insulating coat